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Artificial intelligence solutions running on STM32



VISIT...

LANZAROTE
Caliente.COM

Product development new paradigm

From rule-based engineering to data-driven engineering

Standard programming

Handcrafted rules based on experience



- Requires digital signal processing skills
- Manual feature extraction?
- Need to rewrite if environment evolves

Machine learning

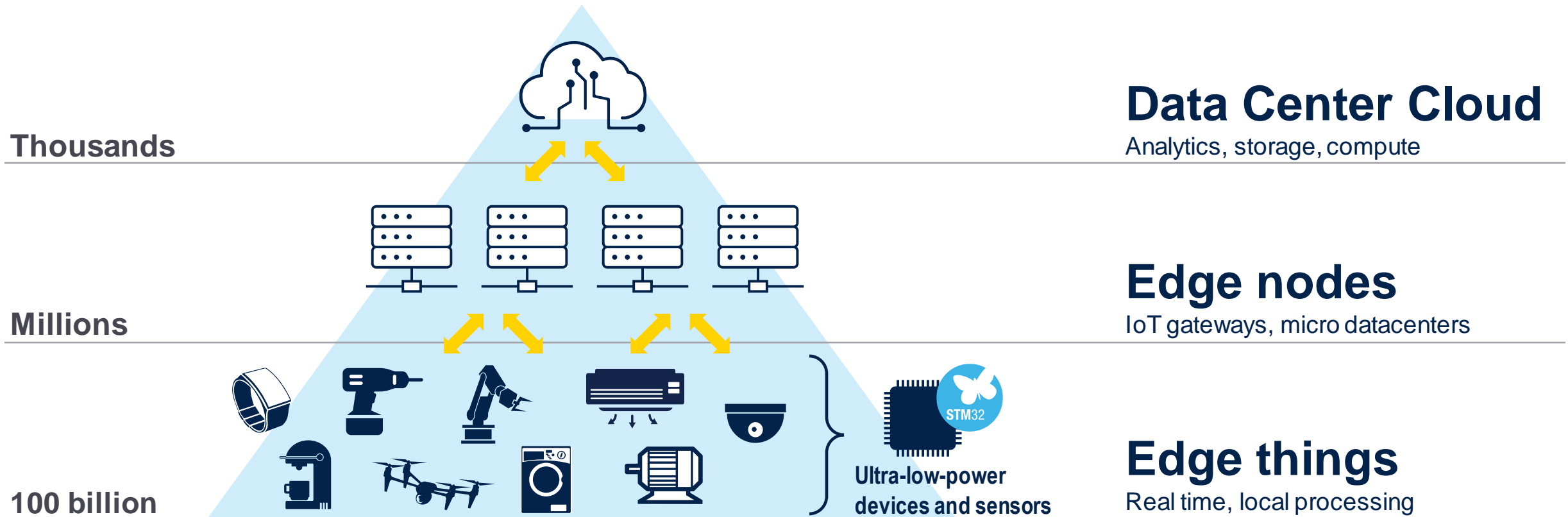
Rules learned from real-world data



- Generate code from real-world observations
- Automated feature extraction?
- Relearn from data if environment evolves

Distributed artificial intelligence approach

Leverage billions of devices at the edge!



Artificial intelligence at the edge

Moving part of artificial intelligence closer to the data acquisition brings several benefits



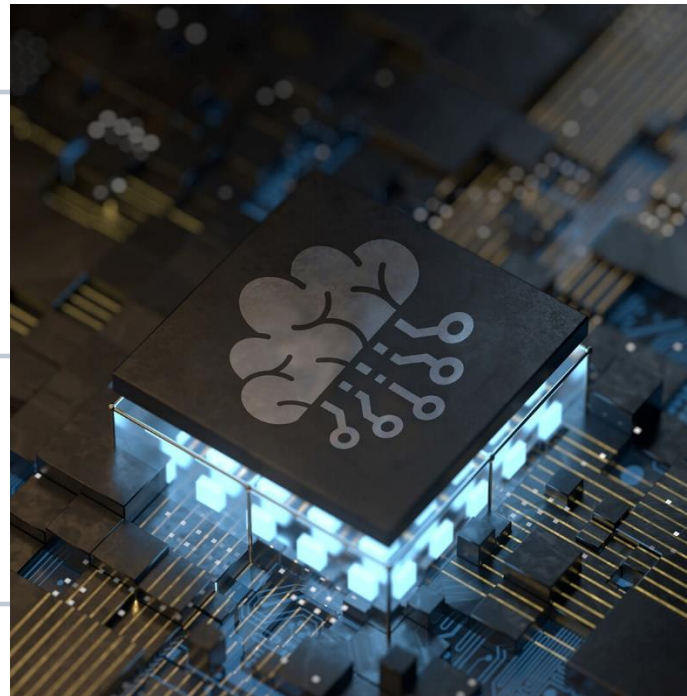
Ultra-low latency
Real-time applications



More reliability



Security of data
No sharing in the cloud



Privacy by design
GDPR compliant



Sustainable on energy
Low-power consumption

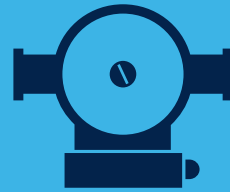


Better user experience

160 billion machines just “want” to do a better job

The washer is not
draining properly
because
a belt is showing
signs of wear

HOME
MAINTENANCE



The pump is about to
break down
due to
a failure on a ball
bearing

INDUSTRIAL
MAINTENANCE

An unusual noise has
been detected
and
recognized as a
window break

SECURITY



Enterprise restaurant
is full
and
your waiting time is
currently estimated
to 15mn

PEOPLE
COUNTING

Start today with deep edge AI











“

If only

**I had solutions to overcome AI
design challenges**

This is where we come in

There is an AI solution for every need

COMPANY'S PROFILE	USE CASES		
	Anomaly detection	Classification	Deep Learning
  Embedded developers <ul style="list-style-type: none">▪ No dataset available▪ No dedicated AI Team			Engineering Services 
  Team with AI expertise <ul style="list-style-type: none">▪ Dataset available▪ AI Team		 	

For embedded developers

NanoEdge AI Studio, an automated ML design solution

NANOEDGE AI
STUDIO 



A unique solution thought from scratch

HOW DID WE DO IT?

We rewrote the algorithms, from the algebra, ML, and signal processing algorithms, so that they can LEARN and INFER inside an MCU.

- Patented technology
- Designed for embedded developers
- Ultra memory efficient (Flash and RAM)
- Unsupervised learning in the device
- Superior security
- Small footprint, runs on any STM32
- Close to 100% accuracy and confidence

For teams with AI expertise

STM32Cube.AI helps you accelerate your embedded development



Easily evaluate, convert, and deploy machine learning and deep neural networks on STM32

An AI extension integrated with the STM32Cube MCU development environment to **optimize** and **tune** models, directly on target.

- Develop and train your model with major AI frameworks



- Best ML performance on STM32 (MLPerf™ Tiny benchmarks)
- Validate performance directly on target
- Small footprint, runs on any STM32



Making Edge AI accessible to all STM32 portfolio

**NanoEdge AI Studio & STM32Cube.AI
are both compatible with all STM32 series**



MPU

STM32MP1

4158 CoreMark
Up to 800 MHz Cortex –A7
209 MHz Cortex –M4



High Perf
MCUs

STM32F3

245 CoreMark
72 MHz Cortex-M4

STM32G4

569 CoreMark
170 MHz Cortex-M4

STM32F2

Up to 398 CoreMark
120 MHz Cortex-M3

STM32F4

Up to 608 CoreMark
180 MHz Cortex-M4

STM32F7

1082 CoreMark
216 MHz Cortex-M7

STM32H7

Up to 3224 CoreMark
Up to 550 MHz Cortex -M7
240 MHz Cortex -M4

Optimized for mixed-signal applications



Mainstream
MCUs

STM32F0

106 CoreMark
48 MHz Cortex-M0

STM32G0

142 CoreMark
64 MHz Cortex-M0+

STM32F1

177 CoreMark
72 MHz Cortex-M3



Ultra-low Power
MCUs

STM32L0

75 CoreMark
32 MHz Cortex-M0+

STM32L1

93 CoreMark
32 MHz Cortex-M3

STM32L4

273 CoreMark
80 MHz Cortex-M4

STM32L4+

409 CoreMark
120 MHz Cortex-M4

STM32L5

443 CoreMark
110 MHz Cortex-M33

STM32U5

651 CoreMark
160 MHz Cortex-M33



Wireless
MCUs

STM32WL

162 CoreMark
48 MHz Cortex-M4
48 MHz Cortex-M0+

STM32WB

216 CoreMark
64 MHz Cortex-M4
32 MHz Cortex-M0+

Latest product generation

ST now offers the ultimate AI solution framework

Stay focused on
your expertise,
we bring you
everything else

Your industry Expertise



- ✓ Lead with true innovation
- ✓ Improved time to market
- ✓ Optimize cost
- ✓ Minimize risks

AI Design Services



Proven methodology to
accelerate ML
innovation process



Certified
partner
ecosystem

AI Software and ecosystem



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Function
Packs

Hardware



ST now offers the ultimate AI solution framework





Releasing your creativity



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For more information,
contact us at edge.ai@st.com

Our technology starts with You



Find out more at stm32ai.st.com/

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